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1987

ALLUVIAL VALLEY FLOOR DECISION DOCUMENT

for Lee Coulee in its entirety to  
its confluence with Rosebud Creek

prepared by

The Montana Department of State Lands  
Reclamation Division  
Capitol Station  
Helena, Montana 59620

June 1987

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## I. INTRODUCTION

The Montana Strip and Underground Mine Reclamation Act, 82-4-227(3)(b)(i) requires that the department not approve an application for mining an alluvial valley floor unless certain requirements are met. To make this determination, the department must make a finding regarding the existence of an alluvial valley floor within or adjacent to any surface mining permit application in accordance with ARM 26.4.325.

In a decision by the United States District Court for the District of Columbia, Civil Action Number 79-1144 in 1980 (the Flannery Decision), the court noted that an alluvial valley floor must satisfy both geologic criteria and hydrologic criteria together which provide sufficient water to sustain agricultural activities. The key to the existence of an alluvial valley floor is the presence of both geomorphic and water availability characteristics which together support agricultural activities. If both sets of criteria are not met, an alluvial valley floor does not exist.

The Montana Strip and Underground Mine Reclamation Act 82-4-203(2) defines an "Alluvial valley floor":

"Alluvial valley floor" means the unconsolidated stream laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits.

In an alluvial valley floor determination, the department must apply this definition to any area in question. ARM 26.4.301 provides a definition for "upland areas" which describes in further detail those areas which would not possess the geomorphic characteristics necessary to meet alluvial valley floor criteria:

"Upland areas" means, with respect to alluvial valley floors, those geomorphic features located outside the floodplain and terrace complex, such as isolated higher terraces, alluvial fans, pediment surfaces, landslide deposits, and surfaces covered with residuum, mud flows or debris flows, as well as highland areas underlain by bedrock and covered by residual weathered material or material deposited by sheetwash, rillwash, or wind.

If the proposed mining permit area in question qualifies under the "upland areas" exclusion, no further consideration as an alluvial valley floor is necessary. In the event that the area does meet the alluvial valley floors definition, the determination must address provisions of the Surface Mining Control and Reclamation Act of 1977, sections 510(b)(5), 515(b)(10)(F), 30 CFR 785.19, 30CFR 822, and Montana rules and regulations: ARM 26.4.325, and 26.4.802-805.

This document addresses the issue of the existence of an alluvial valley floor within and adjacent to the proposed mining permit area of Peabody Coal



Company's Big Sky Mine Area B, Lee Coulee. Lee Coulee extends from above the proposed permit boundary at T1N, R40E, Section 23, MPM to its confluence with Rosebud Creek at T1N, R41E, Section 6, MPM (see Figure 1).

## II. BACKGROUND

No previous alluvial valley floor decisions have included any portion of Lee Coulee. The nearest determination made for any tributary of Rosebud Creek was for Coalbank Coulee in Big Sky Mine Area A. A negative alluvial valley floor decision was made by OSM in its December 1979-TEA for the area, based upon failure to meet the geomorphic criteria for stream channels. The following is an excerpt from that document:

"Using the draft guidelines for alluvial floor determination, Coalbank Coulee does not meet the geomorphic criteria for stream channels. This is an unusual situation where the valley is both streamlaid and subirrigated; however, Coalbank Coulee does not maintain a channel throughout large sections of the lower valley. Therefore OSM has determined that there is not an alluvial valley floor in the Coalbank Coulee drainage. The nearest probable alluvial valley floor is Rosebud Creek, four miles downstream of the proposed mining area. Proposed mining at the Big Sky Mine should have no affect on the alluvial valley floor associated with Rosebud Creek."

The department concurred with the decision in October 1982.

In June 1985, the Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, published a document to assist states in making alluvial valley floor determinations. The document, "Reconnaissance Maps to Assist in Identifying Alluvial Valley Floors, Powder River Basin, Montana and Wyoming" is the result of a reconnaissance level study of potential alluvial valley floors. Figure 1 is a portion of a map from the study. An isolated segment along Lee Coulee is designated as an area believed to be subirrigated in most years based on aerial photography, water-level data, and field inspection. The study, however, clearly states that:

"These maps represent only a reconnaissance-level effort in identification of areas which are likely to meet this definition, and these areas, therefore, are called potential alluvial valley floors. The intent of this mapping effort is to identify areas which might, at a future date, be designated as alluvial valley floors. Because reconnaissance-level data have been used in this study, it is recognized that detailed data collected for any specific area may more conclusively prove or disprove (emphasis added) the alluvial valley floor findings made in this report."

A more comprehensive study conducted by Peabody Coal Company in compliance with ARM 26.4.325 includes detail on geomorphic features, soils, vegetation, irrigation, subirrigation, hydrology, and present and historic land use.





### III. DESCRIPTION OF LEE COULEE

The department has applied the definitions of alluvial valley floor and upland areas to Lee Coulee based on geology, geomorphic processes, geomorphic landforms and descriptions of unconsolidated deposits, including soils. These parameters allow for a determination of whether or not Lee Coulee is, in fact, an alluvial valley floor.

Lee Coulee is located in the northern portion of the Powder River Basin in the Northern Great Plains physiographic province. The location is in a semi-arid area of rolling hills and uplands developed from coarse- and fine-grained sediments. The uplands consist of steeply-sided mesas capped with erosion-resistant clinker atop massive terrigenous sandstones. Lowlands of the valley are a combination of dissected terraces, alluvial fans, and narrow floodplains. Surface deposits are superposed on the Tongue River Member of the Paleocene Fort Union Formation. Isolated remnants of the Formation are still visible within the valley floor. In the Colstrip area, this Formation is 1,700 feet thick. The Formation consists of interbedded massive sandstone, shale, siltstone, coal and clinker.

Detailed mapping of the Lee Coulee drainage basin combined with surface water monitoring clearly demonstrates that geomorphic processes are active in the area. Lee Coulee is an ephemeral drainage exhibiting active headcutting and dissecting of landforms. Tributaries to Lee Coulee exhibit bedrock control, thin cover of unconsolidated deposits and headcutting (Exhibit 7-9 of the permit application shows the detail of the channel slopes and locates outcrops and headcuts.)

Landforms delineated in mapping Lee Coulee include alluvial fans, dissected and isolated terraces and narrow floodplains. Figure 2 (permit application Exhibit 11-1) shows the landforms and demonstrates the dissected nature of the landforms. The landforms are delineated by morphology, by superposition of one landform on or above another, by slope and by soils. The upper portions of slopes hold alluvial fans which flatten-out on terraces or the floodplain. Terraces are discontinuous or isolated remnants. The floodplain is a narrow zone nearest the active ephemeral channel. The location of the channel is controlled by the landforms where either bedrock outcrops or alluvial fans 'push' the channel around them. *red note*

Unconsolidated deposits are located on side slopes and the valley bottom and consist of local slopewash, colluvium and alluvium. Alluvium is confined to the bottom of Lee Coulee and minor areas of narrow tributary drainages. There are also scattered aeolian deposits adjacent to many of the sandstone outcrops.

Where these deposits are stable, soils developing on them can be very deep. The local colluvial contribution of sandy material resulting from the rapid breakdown of sandstones thickens the alluvial deposits and makes delineation of one type of deposit difficult to distinguish from the other. Drill hole information shows that even on colluvial slopes, the rock materials weather rapidly to loose sand. The only coarse materials are shale chips or clinker which are indurated and remain coarse and angular even in fluvial conditions. As a result of these lithologies, rock type or rock size and angularity cannot be used to distinguish between alluvial and colluvial deposits.

[The text on this page is extremely faint and illegible. It appears to be a multi-paragraph document, possibly a letter or a report, with several lines of text visible across the page. The content is too blurry to transcribe accurately.]



Two locations within the valley contain buried soil horizons within the soils profiles. Site 9-13-84-1 is located in the floodplain in the NW $\frac{1}{4}$  of Section 32, T1N, R41E, MPM. The buried soil is at a depth of 32-39 inches within the floodplain. Site 8-23-84-3A located in the NW corner of Section 30, T1N, R41E, MPM also contains a buried soil at a depth of 16-23 inches. This site is above any stream-formed landforms and remains as a remnant after dissection of an older terrain.

#### IV. SITE-SPECIFIC LAND USE

In a report supplemental to the permit application (Geomorphology and Land Use of Lee Coulee, April 21, 1987) Peabody Coal Company documents the geomorphology and agricultural history of cultivated areas within Lee Coulee.

*Upper Dike, ditch*  
The Section 32 field, T1N, R41E, MPM located at the confluence of Lee Coulee and Fossil Fork has been disturbed by activities intended to improve its irrigability. About 50 or 60 years ago an unsuccessful spreader dike system was constructed across the Lee Coulee channel so that flood irrigation would allow hay production. The land was artificially leveled to create a flat field. Since hay production proved unsuccessful, the field has been planted to crops not dependent on subirrigation or flood irrigation.

! (At this same general location the channel of Fossil Fork was filled in by agricultural activity during the 1930's. Subsequent stream flows have not been of sufficient duration, size or energy to incise a new channel even though Lee Coulee is incised throughout its length.

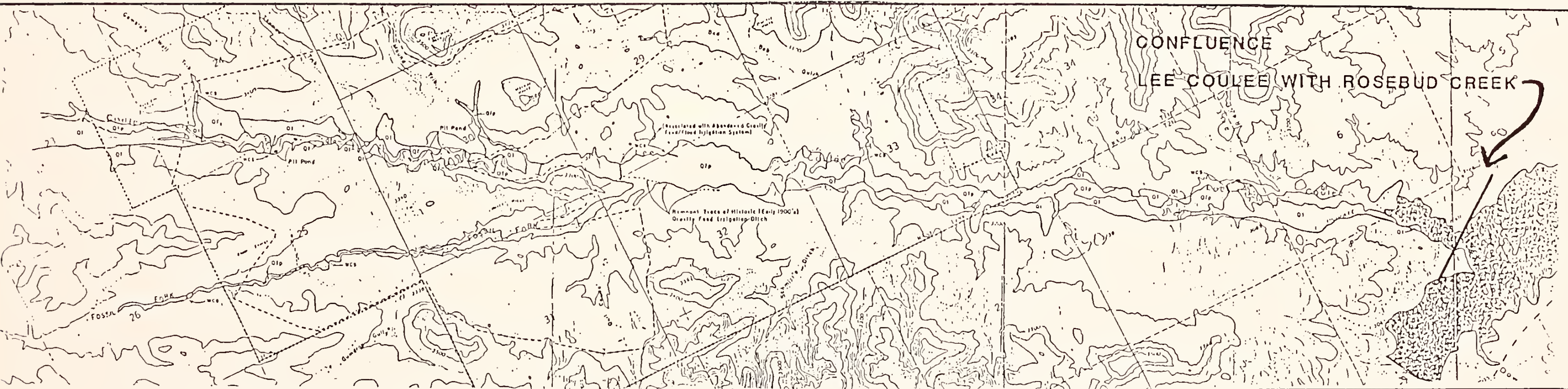
*Lower Dike*  
In Section 1, T1S, R41E, MPM, all of the cropped fields are located on an upland colluvial surface above the incised channel or active flood plain. A dike was constructed across the stream channel for flood irrigation, but has been breached and is not functional.

*also LC: SW to MM trib) part MM*  
Near the Lee Coulee mouth, Section 7, T1S, R41E, MPM, the valley is subirrigated. The original incised channel was filled in by agricultural activity and as above on Fossil Fork has never cut a new channel.

#### V. ALLUVIAL VALLEY FLOOR DETERMINATION

*dike was flooded out too big to dam small dike*  
Detailed geomorphic descriptions of Lee Coulee and its tributaries have shown that the valley contains alluvial fans, isolated terraces, residual surfaces, and aeolian deposits. The natural channel of Lee Coulee and its tributaries is incised below any existing floodplain. Attempts to utilize flows for flood irrigation have proven to be unsuccessful. As a result of the geomorphic descriptions of the Lee Coulee drainage and its inability to be utilized as an irrigated agricultural area using normal regional practices, the Department has determined that Lee Coulee and its tributaries meet the definition of upland areas, and therefore, do not satisfy the geologic criteria of an alluvial valley floor.





**EXHIBIT II-1**

**ALLUVIAL VALLEY FLOOR AND  
HISTORIC SURFACE WATER USE**

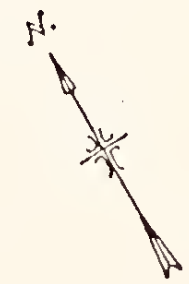
**BIG SKY MINE**

PEABODY COAL CO. 10375 E. HARVARD AVE. DENVER, COLORADO 80231

DESIGNED BY: J.S.O.	SCALE: 1" = 1000'
DRAWN BY: J.M.G.	DRAWING DATE: 11-25-85
CHECKED BY: J.S.D.	PHOTO DATE:
REVISIONS	

**LEGEND**

- PERMIT BOUNDARY
- DISTURBANCE LIMIT BOUNDARY
- Qfp ALLUVIAL FLOOD PLAIN
- Qf ALLUVIAL FAN
- Qt ALLUVIAL TERRACE
- ~~~~~ SUBIRRIGATED RANGELAND (Hayland/  
Pastureland along Rosebud Creek)
- WATER CONTROL STRUCTURE (WCS)  
(Includes Dams and Spreader Dikes)
- EXCAVATED PIT POND
- +— ALLUVIAL TRANSECT



**FIGURE 2**

